SECTION A

A Watershed Approach to Contamination from Abandoned Mine Lands: The USGS Abandoned Mine Lands Initiative

Thousands of abandoned hard-rock mines located throughout the western United States reflect the historic development of the west, yet at the same time, represent a potential threat to human and environmental health. Abandoned mine lands are areas adjacent to or affected by abandoned mines. Abandoned mine lands often contain mineral deposits, mine wastes (the rock removed to get to the ore deposits), and tailings (the crushed rock left over from the ore processing) that contaminate the surrounding watershed and its associated ecosystem.

Many abandoned mines are located on or adjacent to public lands administered by federal land management agencies. Initiation of cleanup activities at some sites has brought the realization that, in watersheds that may have many hundreds of abandoned mine sites, effective and cost-efficient cleanup requires characterization at a broader scale than the individual sites. It requires a watershed-based approach.

The USGS Abandoned Mine Lands (AML) Initiative is part of a larger strategy of the U.S. Department of the Interior and the U.S. Department of Agriculture to clean up federal lands contaminated by abandoned mines. The USGS AML Initiative was implemented in 1997. It is being conducted in two pilot watersheds - the Boulder River in Montana, and the Upper Animas River in Colorado (figure 1).

The goal of the Initiative is to develop a watershed-based approach for gathering the scientific information needed to effectively characterize and remediate contamination from abandoned mine lands. USGS has formed a multi-disciplined team comprised of ecologists, geologists, water-quality experts, hydrologists, geochemists, and digital data collection and mapping experts from many program areas. The team is providing the scientific knowledge needed by land managers and other stakeholders to mitigate the adverse environmental effects of abandoned mine lands.

The objectives of this interdisciplinary, watershed-based strategy are to:

- Determine the physical, chemical, and biological processes that control the environmental effects of abandoned mine lands.
- Define the extent of contamination and of adverse effects on the aquatic ecosystem.
- Define pre-mining background conditions to establish realistic targets for cleanup activities. Some areas, mined because of their mineral abundance, had affected water quality before mining activities.
- Identify sites that most substantially affect watershed quality and public safety, enabling resources to be invested where they will provide the greatest good.
- Develop scientific information and methods to characterize contamination, evaluate human and environmental health risk, and design and monitor remediation.
- Transfer these methods and information to federal land management agencies and industry to enable efficient clean up of abandoned mine lands nationwide.

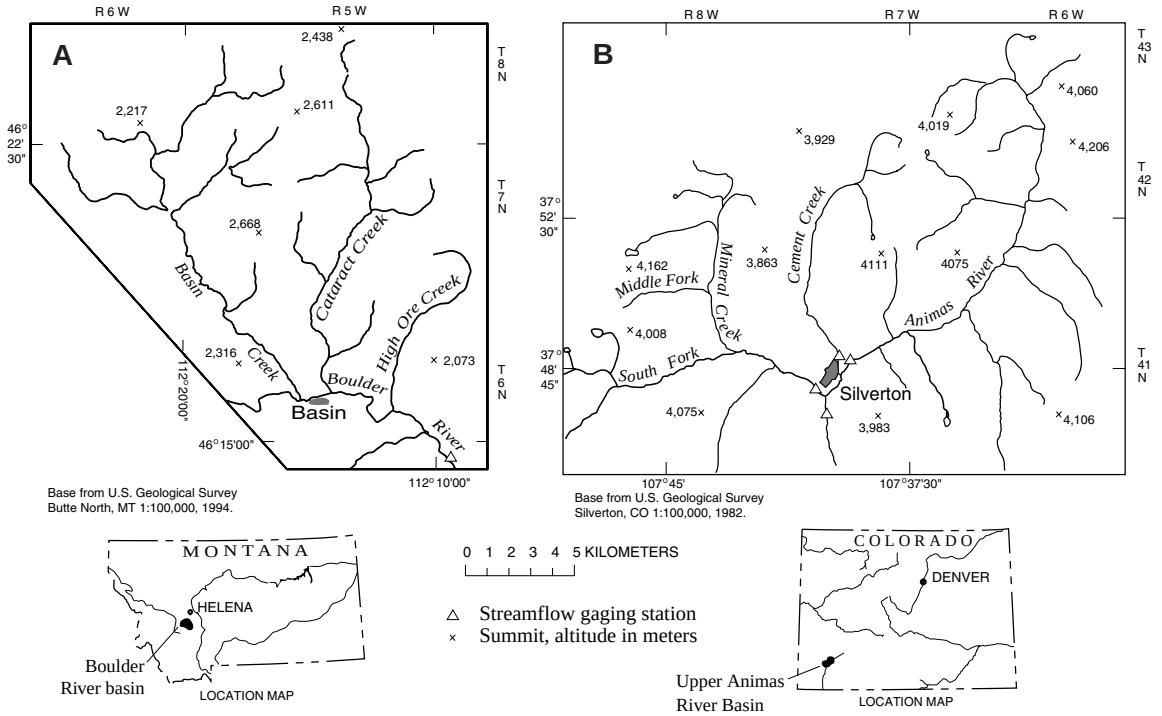

Figure 1. Location of USGS Abandoned Mine Lands Initiative Watershed Investigations. A. Boulder River Montana. B. Upper Animas River, Colorado.

The papers in the following section describe the broad range of scientific methods being developed and applied to characterize contamination from abandoned mine lands in the Boulder River and Upper Animas River watersheds. Today, these scientists are bringing together their diverse expertise to explain the interconnection of physical, chemical, and biological processes that affect the dispersal, and effects of that contamination within a watershed. USGS AML Initiative activities will conclude in the year 2001. Lessons learned regarding successful implementation of a watershed approach to characterize contamination from abandoned mine lands will be presented. However, the investigators already are assured that close collaboration among an interdisciplinary team of scientists is an essential ingredient for success.

More information on the USGS AML Initiative is available on the World Wide Web at: **http://amli.usgs.gov/amli/**.

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